

37512

~2/164

HISTORY OF
THE AIR FORCE LOGISTICS COMMAND
1 July 1962--30 June 1963

PART II: MISSION ACTIVITIES

THE CUBAN CRISIS AFTERMATH IN AFLC
October 1962--November 1963
(Unclassified)

Text

THIS VOLUME CONTAINS INFORMATION DRAWN
FROM IG INSPECTION REPORTS WHICH MAY
NOT BE RELEASED TO NON-AIR FORCE
PERSONNEL WITHOUT PERMISSION OF THE
SECRETARY OF THE AIR FORCE

HISTORICAL STUDY NO. 343



87-AIR-827- LC

~~SECRET~~

HISTORY OF
THE AIR FORCE LOGISTICS COMMAND
1 July 1962--30 June 1963

PART II: MISSION ACTIVITIES

THE CUBAN CRISIS AFTERMATH IN AFLC
October 1962--November 1963
(Unclassified)

Text

Classification: XoxW Ltr, 22 May 75
Declassify: 31 December 1973

Historical Study No. 343

~~DECLASSIFIED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10~~

This history is classified SECRET because it contains information on war plans and deficiencies in USAF operations.

Prepared under provisions of AF Regulation No. 210-3 as a part of the USAF Historical Program.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18 U.S.C., Sections 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

64MCKH-002-2

~~SECRET~~

~~SECRET~~
HISTORY OF
THE AIR FORCE LOGISTICS COMMAND
1 July 1962--30 June 1963

PART II: MISSION ACTIVITIES

THE CUBAN CRISIS AFTERMATH IN AFLC
October 1962--November 1963
(Unclassified)

Text

Prepared By

BARR O. BRAMAN, A.B.
DOROTHY L. MILLER, A.B.

Historical Research Division
Air Force Logistics Command
Wright-Patterson Air Force Base
February 1964

~~SECRET~~
DOWNGRADED AT 12 YEAR
INTERVALS; NOT AUTOMATICALLY
DECLASSIFIED. DOD DIR 5200.10

64MCKH-002-2

UNCLASSIFIED

CONTENTS

CHAPTER I: THE CRISIS	1
Logistics Preparations	2
AFLC Achievements	3
CHAPTER II: THE CUBAN ROLL-BACK	6
Aerospace Ground Equipment, Including Vehicles	6
War Consumables, Including Munitions	10
CHAPTER III: USAF LOGISTICS SYSTEM PROBLEMS	14
Changes in Force Planning	15
Requirements Procedure Delay	16
R&D Items	16
WRM Deficiencies	17
Priority and Precedence Delay	18
APEX Reports	19
<u>Ad Hoc Committee</u>	19
CHAPTER IV: AFLC PROBLEMS AND SOLUTIONS	21
Communications Tie-up	22
Supply Discipline	22
Liaison with Other Supply Sources . .	23
Maintenance Production Status Reports	24
Manpower Resources	25
Augmented Command Post	26
Other Problems	27
CHAPTER V: AD HOC COMMITTEE PROGRESS . .	28
New Non-Nuclear Stockage Objectives	28
R&D Item Substitutes	29

UNCLASSIFIED

Transportation Requirements	30
Logistics Tie In to the 473L System . .	30
Revision to AFR 67-44.	32
Maintenance Production Lines	33
Other Progress	34
 CHAPTER VI: CONCLUSION	36
 NOTES	40
 GLOSSARY OF ABBREVIATIONS	50
 INDEX	53

SUPPORTING DOCUMENTS (bound separately)

UNCLASSIFIED

I. THE CRISIS

(U) A major confrontation of Soviet and American military power began in the Caribbean area on 23 October 1962. At seven on the preceding evening President Kennedy informed the nation that intelligence efforts had uncovered a Soviet plot to leapfrog American defenses by placing medium and intermediate range missiles and jet bombers in Castro's Cuba. The President announced an immediate "quarantine" of Cuba by U. S. Armed Forces to prevent further deliveries of aggressive weapons. He also directed increased close surveillance of the military buildup in Cuba and threatened "further action" by the Armed Forces if the buildup continued. Furthermore, in unmistakable language he warned the Soviet Union:¹

It shall be the policy of this nation to regard any nuclear missile launched from Cuba against any nation in the Western Hemisphere as an attack by the Soviet Union on the United States, requiring a full retaliatory response upon the Soviet Union.

Finally, he said that the United States would present a resolution before the United Nations calling for "the prompt dismantling and withdrawal of all offensive weapons in Cuba, under supervision of U. N. observers."²

(U) The first reaction of the Soviet Union to the "quarantine"--in effect a partial blockade of Cuba--was a warning that its ships would not submit to a search. Premier Khrushchev also threatened that United States aggression against Cuba could lead to thermonuclear world war. However, he quickly began to back down in the week that followed. The Soviets avoided a direct naval clash by diverting nearly all Soviet-bloc ships enroute to Cuba. The President's warning that further action would be taken unless work on missile bases ceased became creditable when a large U. S. military buildup in Florida and the Caribbean became apparent.

UNCLASSIFIED

(U) Aerial surveillance soon confirmed that the work in Cuba had been halted. United Nations Secretary U Thant used his offices to promote direct United States-Soviet exchanges in which Khrushchev and Kennedy communicated terms for a settlement. On 28 October the threat of war lessened when Khrushchev agreed to dismantle the Cuban bases and remove the missiles under United Nations supervision. However, U Thant failed to persuade Cuban Premier Castro to accept United Nations inspection. Nevertheless, the Soviet actions amounted to virtually complete acceptance of the demands made by President Kennedy.³

Page Not Available

II. THE CUBAN ROLL-BACK

(U) The Cuban Crisis proved many things that needed to be proved. Those tense hours showed how quickly a cold war could change to a hot one, emphasizing the necessity to have war readiness materiel (WRM) in true readiness--both as to amount and condition.

(U) Although the Air Force Logistics Command furnished effective logistics support, it was not an easy job. The command had to meet support requirements without a supporting USAF-approved program. This situation necessitated crash actions to obtain or redistribute assets, with the result that costs were high and normal logistics support was not possible. It was clear that to avoid a similar situation in future emergencies, the Air Force would have to do more advance planning.

(U) In February 1963 USAF headquarters (upon AFLC recommendation) established an ad hoc committee to study the problems of support for contingency operations. The emphasis necessarily would be upon having assets on hand, either pre-positioned at forward bases or in back-up stock. However, advance planning for the roll-back after a crisis was also important and merited study. This study, the command's War and Emergency Plans Branch stated, should be in sufficient detail to insure maintaining both an operational and logistics support capability. 1

Aerospace Ground Equipment, Including Vehicles

(U) By late November the Cuban Crisis had subsided, but the task was not over. The roll-back of supplies and equipment was a big undertaking.

* (U) The vehicles were of many types, including refueling, fire, and cargo handling trucks, forklifts, cranes, runway sweepers, tow tractors, and trailers.

(U) Although the original intention was to return all non-TAC equipment to the owning commands, it did not work out that way. In support of OPlan 312, TAC kept 90 of the 644 vehicles which non-TAC commands supplied to 9 bases during the Cuban Crisis; 275 vehicles were returned to AFLC, and 279 to the other commands. In addition, AFLC was to furnish 122 more vehicles for OPlan 312, while the other commands were to furnish an additional 111.¹⁵

(U) TAC also kept 4,000 pieces of the 5,100 pieces of other equipment (80 line items) that eight AFLC activities had shipped in support of OPlans 312/316. Some quantities retained were in excess of 312 requirements and would be used for OPlan 316, when, and if, approved by Headquarters USAF. About 1,000 pieces of equipment were returned to AFLC depots or shipped direct to other activities to fill back orders.¹⁶

* (U) The original TAC Gray Eagle package was tailored to support only two bases and had an extremely limited number of line items. Additional items were added prior to the Cuban Crisis, and still more were added as the result of experience gained in that contingency. The original package included the following general categories of support: vehicles, tentage and bedding, messing equipment and supplies, basic expendables, water purification supplies, laundry units, bath units, fire fighting equipment, refrigeration, administrative supplies, cleaning supplies, lighting, and hardware.

* (U) War consumable support included auxiliary fuel tanks, pylons, launchers, guns and gun barrels, guided aircraft missiles, guided air rockets, napalm, POL, life vests, and film.

Page Not Available

~~SECRET~~

II

- * (U) In order to have POL located closer to the critical bases during the Cuban emergency, the Air Force leased two retail distribution station terminals from industry. Industry met the demand on very short notice; however, normal supply costs were exceeded since cargo lots were less than the maximum and also required premium transportation.
- ** USAF Short-Range Wartime Requirements/War Consumables Distribution Objective.
- *** Cluster Bomb Special.

UNCLASSIFIED

III. USAF LOGISTICS SYSTEM PROBLEMS

(U) On the first day of the Cuban Crisis the Chief of Staff directed the major commands to keep a historical record of their participation. In a letter to the Air Staff he stressed that thorough documentation of planning decisions and actions was needed to evaluate "the impact of current actions in programming and budgeting for the next fiscal year and as a guide to future Air Force actions."¹ He also said that the record "must include deficiencies and other major problem areas as well as success and achievements."²

(U) In AFLC as well as the other commands the job of providing this historical account fell upon the command historian. Under instructions from the USAF Historical Liaison Office, Headquarters AFLC historians and the field historians prepared separate, detailed chronologies and documentation of the command's participation in the crisis. These chronologies did not represent a complete, analytical history of the command's role. Many of the source documents were hastily prepared during the emergency. The researchers lacked records of most telephone conversations and verbal decisions. And the stringent deadline for the chronologies precluded a complete check of conflicting and uncertain evidence. In brief, the chronologies represented the most reliable day-by-day account that could be written from the voluminous teletypes and correspondence within the time and resources available.³

(U) Before the chronologies had been finished, the Vice Chief of Staff asked for a brief, but comprehensive, evaluation of Air Force performance during the crisis.⁴ The AFLC Historical Division input, an eight page message, included: overall command performance, strengths, problems, lessons learned, and statistics.⁵ Again, this summary represented only the best evaluation that could be drawn at that time and within the space of a few days. The historians lacked the perspectives of time and complete knowledge of other command's participation in the crisis actions. The air materiel areas had forwarded similar evaluation messages to AFLC

UNCLASSIFIED

headquarters on 26-27 November at the request of the Command Post. However, in the rush of events that surrounded the crisis a deadline of less than 24 hours was levied on these evaluations. Consequently, no more than a cursory look could have been taken at the AMA crisis operations. Moreover, the observations of a particular AMA might be colored by incomplete knowledge of the total situation, or might be locally defensible but not reflect a general condition.⁶

(U) Despite the hasty and incomplete nature of the chronologies and summary messages, these products did serve one important function. On the basis of the available evidence, they pointed up some of the problems and object lessons encountered in the Cuban Crisis. These historical products, then, plus the first-hand experience of operating and staff officials formed the basis for AFLC attempts to correct deficiencies and prepare for future contingencies.

Changes in Force Planning

(U) The Cuban Crisis gave AFLC an opportunity to alert the Air Force to the difficulties encountered in logistical support of contingency operations. At a major air commanders' conference on 29 November, AFLC Commander General Mark E. Bradley, Jr., discussed some of the significant problems that had plagued AFLC. At that early date the list of problems could only be looked upon as tentative. However, experience with earlier contingencies in other parts of the world tended to support the list of Cuban Crisis problems.⁷

Page Not Available

(U) General Bradley felt that action should be taken either to provide more funds or to centrally store critical WRM items, such as fuel tanks, pylons, and munitions. Central storage of some items would allow them to be positioned rapidly in areas where they were required. As funds became available, the quantities required in the most distant areas could be prepositioned. The Commander wanted a study group to investigate the problem, unless he could get assurance that funds to procure the necessary items would be made available at an early date.¹⁷

Priority and Precedence Delay

* (U) For an explanation of Air Force doctrine and policy on limited war see Charles H. Hildreth, "USAF Logistic Preparations for Limited War, 1958-1961," October 1962, in AFLC Hist. Archives.

Page Not Available

~~SECRET~~

III

- * (U) The report was compiled by the USAF Historical Liaison Office at Headquarters USAF with input from the major commands involved in the crisis. The appendix included a summary of the major commands' messages on problems and lessons learned.
- ** (U) An excellent case for this contention can be made by comparing the lessons learned in the Cuban Crisis with the report, "USAF Lessons Learned in Lebanon and Taiwan--1958."

UNCLASSIFIED

IV. AFLC PROBLEMS AND SOLUTIONS

(U) The newly formed Directorate of Operations at AFLC headquarters initiated one of the earliest attempts to solve Cuban Crisis support problems. The Command Post, headed by Lieutenant Colonel James E. Sturgis, was assigned the project. Command Post personnel extracted 90 problems mentioned in the AMA chronologies and referred them to the appropriate headquarters components for action. The Command Post recognized that some of the problems were "more fiction than real," but since the chronologies cited the problems, the AMA's should be notified whether action was contemplated or not.¹

(U) The final reports from the directorate on the actions taken on the 90 problems could be listed in five categories. First, in over half of the cases headquarters components did not recognize a valid command-wide problem. Some in this category were immediately eliminated from further consideration; some were considered only locally defensible; and others were considered normal gripes from organizations that had felt pinched for resources or did not understand the broader implications of a particular action. In a second category were problems which could not be solved by AFLC alone. The USAF Ad Hoc Committee on Support of Contingency Operations took up some of these problems on an Air Force-wide basis. Third, AFLC headquarters components considered some problems to have been at least temporarily solved during the crisis. Here again, the Ad Hoc Committee picked up the broader implications of some of these problems. Fourth, headquarters components forwarded the problems concerning a particular commodity or system to the individual AMA's for local solution. Finally, the list contained some twenty-odd problems for which Headquarters AFLC attempted to find solutions. For purposes of discussion, however, the number of problems in the last category can be considerably narrowed by combining many of the similar ones.²

UNCLASSIFIED

Page Not Available

(U) Immediately after the crisis, the Manpower and Organization Division at AFLC headquarters requested workload information from the AMA's so that it could provide more guidance in future contingencies. The division asked for answers to the following questions:¹⁶

- a. What were the lower priority work-loads your AMA postponed or dropped in order to provide the resources to meet 314 requirements?
- b. What functions, if any, did you cease to perform?
- c. From what offices did you detail personnel and to what functions did you detail these personnel . . . ? In what functions was overtime used and to what degree . . . ?

Manpower and Organization intended to chart the information received by functional areas so the common problem areas could be isolated. But, it found this impractical because neither the additional requirements nor the methods used to supply more manpower showed any consistency among the AMA's. Since the AMA's had successfully met the additional workload requirements by various means, Manpower and Organization concluded that specific planning for limited emergencies was unnecessary.¹⁷

Augmented Command Post

(U) On 24 September 1963 AFLC headquarters established new instructions for Command Post augmentation. The HOI contained separate instructions for an emergency action staff operating under strategic warning of general

~~SECRET~~

IV

war. For emergencies short of strategic warning and exercises, an accelerated action staff would operate the augmented Command Post. The action staff teams were similar in composition to the old teams, but the instructions for each headquarters component involved were much more explicit. Further, a given staff representative would only attempt to accomplish all the required actions when the workload for his activity was minimal. Should the workload increase, actions would be accomplished in the normal operating environment. Also, message processing and distribution would be provided from the normal operating location, but all messages would be routed through the action staff. 20

Other Problems

~~SECRET~~

[REDACTED]

V. AD HOC COMMITTEE PROGRESS*

(U) At the 27-29 March 1963 meeting of the Ad Hoc Committee, AFLC representatives outlined the problem areas which needed resolution before the command could completely support contingency operations worldwide. Most of the difficulties were similar to those covered by General Bradley in his remarks before the Air Force commanders in November. In the ensuing weeks the committee and the functional components at USAF, TAC, and AFLC headquarters began to tackle these difficult support problems. Quick solutions did not follow in most cases. Some solutions depended upon the new non-nuclear war tactics which had not been clearly established, and many other required actions needed prerequisite changes in existing concepts, policies, and procedures at Air Force and DOD levels. Thus, progress in the year following the Cuban Crisis was slow and tedious. The Ad Hoc Committee used most of the remaining weeks in FY 1963 to define the problem areas and discuss possible solutions.¹

New Non-Nuclear Stockage Objectives

* (U) After completion of the narrative and just prior to the release of this history, additional documents related to Ad Hoc Committee progress became available. See Docs. 43, 45, 47, for the latest information on progress in Air Force support of contingency operations.

Page Not Available

Revision to AFR 67-44

(U) In another action, Headquarters USAF initiated a revision of the war readiness materiel regulation--AFR 67-44. The regulation explained Air Force policy and responsibilities for authorization, stockage objectives, location distribution, accounting, preservation, and management of WRM. As a result of the Cuban Crisis and a January-March 1963 inspection of the WRM program, USAF recognized inadequacies in the current AFR 67-44.¹⁵

(U) Maintenance Engineering at Headquarters AFLC proposed a revision to AFR 66-3 covering automatic compression and automatic input stoppages.²¹ Headquarters USAF published the revised regulation on 24 June 1963. It continued Headquarters USAF responsibility for compression

~~SECRET~~

or acceleration schedules, including input stoppages, during limited emergencies. USAF headquarters would also develop and specify the actions to be taken in accelerating or compressing maintenance or modification prior to general war D-Day. These specifications would vary according to the particular circumstances.²² When this history was written, however, USAF had not yet provided specific guidance concerning discontinuance of input into maintenance facilities during emergencies.²³

Other Progress

Page Not Available

~~SECRET~~

VI. CONCLUSION

(U) Although the Cuban Crisis did not involve American forces in any combat action, it constituted the clearest immediate military danger to the United States since World War II and the only close threat in distance to the continental U. S. in the twentieth century. It involved a considerable emergency movement of U. S. forces into Florida bases and the Caribbean area. The rapid movement of troops, ships, and aircraft in response to the critical situation only 90 miles from the U. S. shoreline required widespread, coordinated activities by the military services in planning, intelligence, logistics, and operations. These activities were complicated by the need to deter a strategic threat at the same time. In these circumstances the Air Force gained important knowledge for the support of contingency operations in the future, and AFLC added more lessons to those learned in past emergencies.

(U) AFLC's successful support of the Cuban buildup, however, did not offer a completely typical or realistic example for all contingency planning in the future. In the first place the criticalness of materiel shortages and deficiencies for actual combat operations could only be projected. Second, the emergency supply pipeline to oversea areas was not tested to any extent. Third, the Cuban experience was not an adequate test of simultaneous support for two or more widely separated trouble spots. Nor was it a test of logistical reaction to a threat of a less critical nature. More than anything else, perhaps, the Cuban Crisis prompted the Air Force to strengthen its support of contingency operations by focusing attention on certain weaknesses which had been overlooked or ignored in the past.

Page Not Available

(U) In regard to the fact gathering and problem solving techniques, the Cuban Crisis experience left room for improvement at the AFLC headquarters level. The Historical Research Division compiled the only extensive record of AFLC participation from a command-wide point of view. Yet, this Cuban Crisis chronology was by no means a critical analysis of the command's operations. It merely gave a day-by-day account of significant AFLC actions. Although the entire historical staff worked on the project, a short deadline and limited manpower meant that only the most easily accessible records could be used and that most evidence had to be accepted at face value. These limitations were even more restrictive when the historical staff was directed to prepare a brief, but comprehensive, evaluation of the command performance. Again, with a stringent deadline the historians relied almost completely on the unilateral observations of the staff and operating officials. While these people could, of course, give the most knowledgeable account of operations in their own particular field, they were not necessarily equipped to check the validity of their own observations and criticisms from the command or Air Force-wide point of view.

(U) A similar situation arose when the Command Post selected 90 problems from the AMA chronologies and hastily-prepared evaluation messages. The Command Post did not attempt to select "problems" on the basis of validity, but merely as a representative sample of AMA complaints and suggestions. Quite naturally, in the heat of the crisis or immediately afterwards, AMA officials made observations that did not hold up after careful evaluation or that were unrealistic from a command-wide point of view. Unfortunately, the so-called problems that were "more fiction than real" tended to downgrade the ones that merited further study. Also, the very success of AFLC's support mission in the face of difficult obstacles worked against efforts to correct the real problems. Under these circumstances, it was perhaps understandable that the AFLC staff's replies to complaints about their procedures often tended to be defensive and to justify past actions rather than to openly admit the validity of a search for better alternatives in the future.

(U) Nevertheless, the Cuban Crisis documentation and evaluation efforts did have positive benefits. Several problems and deficiencies were uncovered which could have been more serious in a combat situation. The documentation offered evidence that similar logistics problems from past crises had not been completely solved. In many cases it backed up the contentions of the AFLC representatives to the Ad Hoc Committee. Finally, the evaluation efforts of AFLC officials started constructive thinking toward improved support for future contingency operations.

UNCLASSIFIED

NOTES, CHAPTER I

1. Lester A. Sobel, ed., Facts on File Yearbook, 1962 (New York, 1963), Vol. XXII, p. 361.
2. Ibid.
3. Ibid., pp. 361, 373.
4. "AFLC Partic. in the Cuban Crisis, a Chronology, 14 Oct.--10 Dec. 1962," prep. by Hist. Div., Hq. AFLC, 16 Jan. 1963, pp. v, vi, in AFLC Hist. Archives. [Hereafter cited as Cuban Crisis Chronology.]
5. Ibid., pp. xi, xiii, xviii.
6. Ibid., pp. xviii, 7.
7. Ibid., pp. 72, 78, 85, 113.
8. Presentation, Lt. Col. J. E. Sturgis, Chief, Com. Post Ops. Br., Ops. Div., D/O, Hq. AFLC, to USAF World-Wide Com. Post. Conf., 6 Feb. 1963, in Com. Post files.
9. Msg., MCG 291 (AFLC) to all AFLC Installs., 30 Nov. 1962, in Cuban Crisis Chronology, Doc. 230.
10. Ltr., Lt. Col. Edward S. Ash & Walter M. Wilson, AFLC Ad Hoc Comm. members, to D/Plans & Progs., Hq. AFLC, 10 April 1963, Doc. 29, p. 5.

NOTES, CHAPTER II

1. "Hq. USAF Current Status Presentation--Consol. of Hq. AFLC Subj. Input Rpts., 14 & 28 March 1963," prep. by Mgmt. Anal. Div., Compt., Hq. AFLC, in AFLC Hist. Archives.

UNCLASSIFIED

UNCLASSIFIED

Notes, II

2. Ltr., Maj. Gen. Marvin L. McNickle, D/S, Hq. AFLC, to Comdr., AFLC, 21 Nov. 1962, Doc. 4.
3. "AFLC Partic. in the Cuban Crisis, a Chronology, 14 Oct. -- 10 Dec. 1962," prep. by Hist. Div., Hq. AFLC, 16 Jan. 1963, p. 95, in AFLC Hist. Archives. [Hereafter cited as Cuban Crisis Chronology.]
4. Presentation, Lt. Col. J. E. Sturgis, Chief, Com. Post Ops. Br., Ops. Div., D/O, Hq. AFLC, to USAF World-Wide Com. Post Conf., 6 Feb. 1963, in Com. Post files.
5. Wire, DM 2-11294 (TAC) to Hq. SAC, et al., 1 Dec. 1962, in Special Missions Support Br., Aerospace Div., D/S, files.
6. Wire, DM 2-11256 (TAC) to 2nd Provisional Airlift Wing, et al., 26 Nov. 1962, in Cuban Crisis Chronology, Doc. 214.
7. Msg., MCSD 66972 (AFLC) to Hq. TAC, 29 Nov. 1962, Doc. 5.
8. Msg., MCSEE 3821 (AFLC) to Hq. TAC, 11 Dec. 1962, in Support Equip. Br., Equip. Mgmt. Div., D/S, files, Roll Up and 312.
9. Wire, DM 2-11318 (TAC) to C/S, USAF, and Hq. AFLC, 5 Dec. 1962, in Support Equip. Br. files, Roll Up and 312.
10. Wire, AFSSS-GS 60014 (C/S, USAF) to Hq. AFLC & Hq. TAC, 5 Dec. 1962, Doc. 10.
11. Msg., MCS 3758 (AFLC) to ROAMA et al., 5 Dec. 1962, Doc. 13.
12. Wire, DM 3-10172 (TAC) to Hq. SAC, 21 Feb. 1963, Doc. 20.
13. Wire, DMSEBV 05-4169 (TAC) to 2709th AF VCG, 29 May 1963, in Support Equip. Br. files, TAC OPlan 312.

UNCLASSIFIED

UNCLASSIFIED

Notes, II

14. Ltr., Russell Hall, Equip. Mgmt. Div., to Mission Support Div., 29 Jan. 1963, Subj.: Roll-Up for OPS 314, in Support Equip. Br. files, Roll-Up and 312.
15. Ibid.; Memo., Mr. Hall, 1 Feb. 1963, Subj.: Vehicles, in Support Equip. Br. Files, Roll-Up and 312.
16. Memo., Mr. Hall, 1 Feb. 1963.
17. Wire, DM 2-11256 (TAC) to Hq. 2nd Provisional Air-lift Wing et al., 26 Nov. 1962.
18. Memo. for the Record, Lt. Col. Edward S. Ash, Ops. Officer, War & Emergency Plans Br., Plans Div., D/Plans & Progs., Hq. AFLC, and Col. R. D. Swett, Chief, Mission Support Div., 26 Feb. 1963, Doc. 23.
19. Cuban Crisis Chronology, passim; Ltr. for Wash., prep. by Mr. Hall, 18 Feb. 1963, Subj.: Equip. Support for Contingencies, in Support Equip. Br. files, Roll-Up and 312.
20. Doc. 23.
21. Wire, DMSEBV 05-4169 (TAC) to 2709th AF VCG, 29 May 1963.
22. Ltr., Lt. Col. Ash & Walter M. Wilson, AFLC Ad Hoc Comm. members, to D/Plans & Progs., 10 April 1963; Memo., Lt. Col. Ash & Mr. Wilson, 21 May 1963, Docs. 29, 36.
23. Presentation by Lt. Col. Sturgis, 6 Feb. 1963.
24. Ltr., Maj. Gen. H. C. Porter, D/Plans & Progs., to Comdr., AFLC, 5 Oct. 1962, Subj.: AFTF 126 OPLAN 314, in Special Missions Support Br. files; Working paper, prep. by Special Missions Support Br., 4 Dec. 1962, Doc. 8; Cuban Crisis Chronology, passim.
25. Msg., MCSDT 16440 (AFLC) to Hq. TAC, 7 Feb. 1963, in Special Missions Support Br. files.

UNCLASSIFIED

UNCLASSIFIED

Notes, II & III

26. Wire, DM 2-11285 (TAC) to Hq. AFLC & Hq. AFSC, 1 Dec. 1962, Doc. 6.
27. Msg., MCS 3751 (AFLC) to Hq. TAC et al., 5 Dec. 1962, Doc. 9.
28. Working paper, prep. by Special Missions Support Br., circa 23 Jan. 1963; Wire, DM 2-11316 (TAC) to C/S, USAF, 5 Dec. 1962, Docs. 14, 11.
29. Doc. 11.
30. Wire, AFXPDFS 78342 (C/S, USAF) to Hq. AFLC, SAC, TAC, 20 Feb. 1963, Doc. 19.
31. Msg., MCS 629 (AFLC) to C/S, USAF, Hq. SAC, TAC, 5 March 1963, Doc. 25.
32. Ibid.; Msg., MCSF 544 (AFLC) to MAAMA, 26 Feb. 1963, Doc. 22.
33. Docs. 19, 22.
34. Wire, DMPLMDM 3-10436 (TAC) to 8th AF & Hq. AFLC, 24 May 1963, in Special Missions Support Br. files.
35. Ibid.

NOTES, CHAPTER III

1. Ltr., Mr. Joseph W. Angell, Jr., Chief, USAF Hist. Liaison Office, to Hist. Div., Hq. AFLC, 5 Nov. 1962, Doc. 3.
2. Ibid.
3. "AFLC Partic. in the Cuban Crisis, a Chronology, 14 Oct.--10 Dec. 1962," prep. by Hist. Div., Hq. AFLC, 16 Jan. 1963, p. iii, in AFLC Hist. Archives. [Hereafter cited as Cuban Crisis Chronology.]

UNCLASSIFIED

UNCLASSIFIED

Notes, III

4. Wire, AFCHO 1911 (Hq. USAF) to all Maj. Coms., 1 Dec. 1962, in Hist. Res. Div. files.
5. Msg., MCKH 3762 (AFLC) to Hq. USAF, 5 Dec. 1962, Doc. 12.
6. Cuban Crisis Chronology, pp. iii, 147-166.
7. Presentation, Gen. Mark E. Bradley, Jr., Comdr., AFLC, to USAF Comdrs. Conf., 29 Nov. 1962, in Cuban Crisis Chronology, Doc. 229.
8. Ibid.; Cuban Crisis Chronology, pp. iv, 17-18.
9. Ltr., Lt. Col. Edward S. Ash & Walter M. Wilson, AFLC Ad Hoc Comm. members, to D/Plans & Progs., Hq. AFLC, 10 April 1963, Doc. 29, p. 2.
10. Presentation by General Bradley, 29 Nov. 1962.
11. Ibid.
12. Cuban Crisis Chronology, pp. 10, 96, 125, 164.
13. AMA chronology extractions and replies, prep. by Com. Post Ops. Br., Ops. Div., D/Q Hq. AFLC, 20 March 1963, Doc. 27, p. 25.
14. Presentation by Gen. Bradley, 29 Nov. 1962.
15. Charles H. Hildreth, "USAF Log. Preparations for Limited War, 1958-1961," Oct. 1962, pp. 23-26, in AFLC Hist. Archives.
16. Cuban Crisis Chronology, p. 165.
17. Presentation by Gen. Bradley, 29 Nov. 1962.
18. Cuban Crisis Chronology, pp. x, 7.
19. Presentation by Gen. Bradley, 29 Nov. 1962.
20. Ibid.; Cuban Crisis Chronology, pp. 38, 55.

21. Ltr., Gen. Bradley to Hq. USAF, 29 Jan. 1963, Doc. 15.
22. Ltr., Gen. Bradley to Hq. USAF, 6 Feb. 1963, Doc. 17.
23. Ltr., Gen. Bradley to D/S et al., 14 March 1963, Doc. 26.
24. Ltr., Maj. Gen. John K. Hester, Asst. VC/S, USAF, to Hq. AFLC, 28 Feb. 1963, Doc. 24.

NOTES, CHAPTER IV

1. Ltr., W. O. Lockwood, Actg. Chief, Ops. Div., D/O, Hq. AFLC, to Com. Post Ops. Br., 31 Jan. 1963, Doc. 16.
2. AMA chronology extractions and replies, prep. by Com. Post Ops. Br., 20 March 1963, in Com. Post files. [See Doc. 27 for selected pages from this document.]
3. Doc. 27, pp. 8-9.
4. "USAF Lessons Learned in Lebanon and Taiwan-1958," prep. by D/O, Hq. USAF, n/d, pp. 29, 64, in AFLC Hist. Archives.
5. Doc. 27, pp. 8-9.
6. Ibid., pp. 19, 57, 61, 68.
7. Ibid., pp. 8-9.
8. Ibid., pp. 21, 42.
9. "AFLC Partic. in the Cuban Crisis, a Chronology, 14 Oct. --10 Dec. 1962," prep. by Hist. Div., Hq. AFLC, 16 Jan. 1963, pp. 9, 40, in AFLC Hist. Archives. [Hereafter cited as Cuban Crisis Chronology.]

UNCLASSIFIED

Notes, IV

10. Doc. 27, pp. 21, 42.
11. Memo. for the record, Lt. Col. Edward S. Ash, Chief, War & Emergency Plans Br., Plans Div., D/Plans & Prog., Hq. AFLC, circa Nov. 1963, in War & Emergency Plans Br. files.
12. "A Chronology of OCAMA's Partic. in the Cuban Crisis, 14 Oct.--21 Nov. 1962," prep. by Hist. Office, OCAMA, 17 Dec. 1962, pp. 23, 28, 40, in AFLC Hist. Archives.
13. Doc. 27, p. 85.
14. Interview with Lt. Col. J. E. Sturgis, Chief, Com. Post Ops. Br., Ops. Div., 27 Nov. 1963.
15. Doc. 27, pp. 36, 43, 50, 51, 54.
16. Ibid., p. 54.
17. Ibid.
18. Presentation, Lt. Col. Sturgis to USAF World-Wide Com. Post Conf., 6 Feb. 1963, in Com. Post files.
19. Ibid.
20. Hq. AFLC HOI 55-3, 23 Aug. 1962, 24 Sept. 1963, Docs. 2, 42.
21. Ltr., Col. Ralph A. Johnson, Chief, Proc. Div., D/P&P, Hq. AFLC, to Hist. Div., Hq. AFLC, 4 Dec. 1962, Doc. 7.
22. "Crisis Documentation Guide for AFLC Historians," prep. by Hist. Res. Div., 20 Aug. 1963, Doc. 41.
23. Doc. 27, pp. 62, 78, 79, 81.

UNCLASSIFIED

UNCLASSIFIED

Notes, V

NOTES, CHAPTER V

1. Ltr., Brig. Gen. Richard W. Fellows, D/Plans & Progs., Hq. AFLC, to Plans Div., D/Plans & Progs., Hq. AFLC, 14 May 1963, Doc. 35; Weekly Status Rpt., prep. by War & Emergency Plans Br., Plans Div., circa 18 Oct. 1963, Doc. 46 (26 Aug. 1963 heading).
2. Atch. 1 to Ltr., Maj. Gen. Melvin F. McNickle, D/S&S, Hq. USAF, to Hq. AFLC et al., 11 April 1963, Doc. 30, pp. 1-2, 10.
3. Working Paper, prep. by Policy Control Office, D/P&P, Hq. AFLC, 26 March 1963, Doc. 28.
4. Action item report for support of contingency operations, prep. by War & Emergency Plans Br., 8 Oct. 1963, Doc. 44.
5. Ltr., Lt. Col. Edward S. Ash & Walter M. Wilson, AFLC Ad Hoc Comm. members, to D/Plans & Progs., Hq. AFLC, 10 April 1963, Doc. 29, p. 5.
6. Docs. 29, 44.
7. Atch. 1 to Memo. for Col. Bethune from Lt. Col. Ash, 19 April 1963, Doc. 32.
8. Ibid.; Doc. 29.
9. Ltr., Gen. William F. McKee, VC/S, USAF, to Hq. AFLC, 9 Feb. 1963, Doc. 18.
10. Reinold H. Marvin, "Maj. Hist. of Rome AMA and Griffiss AFB at Rome, New York, 1 July 1960--30 June 1961," Vol. I, circa Jan. 1962, pp. 109-110, in AFLC Hist. Archives.
11. Doc. 18.
12. Doc. 29, p. 7.

UNCLASSIFIED

UNCLASSIFIED

Notes, V

13. Memo., Lt. Col. Ash & Mr. Wilson, 21 May 1963, Doc. 36, p. 3.
14. Doc. 44.
15. Ltr., Col. F. H. Foerster, Jr., Dep. D/Plans & Progs., to IG, Hq. AFLC, 10 May 1963, and Atch. 1 thereto, in AFLC Hist. Archives.
16. Ltr., Lt. Col. Herbert H. Bennett, Plans & Anal. Gp., D/S&S, Hq. USAF, to Hq. AFLC, 13 May 1963, and Atch. thereto, Doc. 34.
17. Ltr., Col. Albert H. Bethune, Chief, Plans Div., to Hq. USAF, 28 May 1963; AFR 67-44, 5 Aug. 1963, Docs. 38, 39.
18. AFR 67-44, 1 May 1962, Doc. 1.
19. Doc. 29.
20. Atch. to Ltr., Col. A. A. Juhasz, Chief, Plans & Prod. Div., D/ME, Hq. AFLC, to Plans Div., 25 Feb. 1963, Doc. 25.
21. Ltr., Col. James I. Cornett, Actg. D/ME, to D/Plans & Progs., 22 May 1963, Doc. 37.
22. AFR 66-3, 24 June 1963.
23. Doc. 44.
24. Ibid.
25. Ltr., Brig. Gen. Fellows to Comdr., AFLC, 7 Aug. 1963, Doc. 40.

UNCLASSIFIED

Notes, VI

NOTES, CHAPTER VI

1. Ltr., Col. F. H. Foerster, Jr., Dep. D/Plans & Progs., Hq. AFLC, to D/S, Hq. AFLC, 12 April 1963, and 1st Ind. thereto, Doc. 31.
2. Charles H. Hildreth, "USAF Log. Preparations for Limited War, 1958-1961," Oct. 1962, pp. 1-2, 54-56, in AFLC Hist. Archives.
3. Ltr., Gen. Mark E. Bradley, Jr., Comdr., AFLC, to D/S et al., 14 March 1963, Doc. 26.

UNCLASSIFIED

UNCLASSIFIED

GLOSSARY

Actg.	Acting
ADC	Air Defense Command
AFB	Air Force Base
AFLC	Air Force Logistics Command
AFM	Air Force Manual
AFR	Air Force Regulation
AFSC	Air Force Systems Command
AF VCG	Air Force Vehicle Control Group
AGE	Aerospace Ground Equipment
AMA	Air Materiel Area
Anal.	Analysis
Atch.	Attachment
Br.	Branch
CMDO	Consolidated Materiel Distribution Objective
Com(s).	Command(s)
Comdr.	Commander
Comm.	Committee
Compt.	Comptroller
Conf.	Conference
Consol.	Consolidation
C/S	Chief of Staff
Dep.	Deputy
Div.	Division
D/ME	Director(ate) of Maintenance Engineering
D/O	Director(ate) of Operations
Doc(s).	Document(s)
DOD	Department of Defense
D/P&P	Director(ate) of Procurement and Production
D/Plans & Progs.	Director(ate) of Plans and Programs
D/S	Director(ate) of Supply
DSA	Defense Supply Agency
D/S&S	Director(ate) of Supply and Services

UNCLASSIFIED

ed.	editor
Equip.	Equipment
Hist.	History, Historical
HOI	Headquarters Office Instruction
Hq.	Headquarters
IG	Inspector General
Installs.	Installations
Log.	Logistics
Ltr.	Letter
MAAMA	Middletown Air Materiel Area
MATS	Military Air Transport Service
Memo.	Memorandum
Mgmt.	Management
Msg.	Message
n/d	no date
OCAMA	Oklahoma City Air Materiel Area
Ops.	Operations
p.(pp.)	page(s)
PACAF	Pacific Air Forces
Partic.	Participation
POL	Petroleum, oil, and lubricants
prep.	prepared
Proc.	Procurement
Prod.	Production
Res.	Research
ROAMA	Rome Air Materiel Area
Rpt(s).	Report(s)
SAAMA	San Antonio Air Materiel Area
SAC	Strategic Air Command
Subj.	Subject
TAC	Tactical Air Command

UNCLASSIFIED

U. N.	United Nations
USAF	United States Air Force
USAFE	United States Air Forces in Europe
VC/S	Vice Chief of Staff
Vol.	Volume
WRAMA	Warner Robins Air Materiel Area
WRM	War Readiness Materiel

UNCLASSIFIED

UNCLASSIFIED

INDEX

AD HOC COMMITTEE ON SUPPORT OF CONTINGENCY OPERATIONS, 6, 20-21, 27-35, 37, 39
Aerial surveillance, 2
Aerospace ground equipment (AGE), 4, 6-10
AFLC Commander, 4; see also Bradley, General Mark E. (Jr.)
Africa, 9
AFStrike, 15-16
Air Defense Command (ADC), 3, 15, 19
Air Force commanders, 4
Air Force commands, 10; see also Major air commands
Air Force Manual 55-11, 19, 25
Air Force Regulation 67-44, 32-33
Air Force Reserve, 3, 34
"Air Force Response to the Cuban Crisis," 19-20
Air Force Systems Command (AFSC), 11
Air materiel areas (AMA's), 3, 10, 14-15, 21-27, 31, 38; see also individual AMA's
Air National Guard, 3, 34
Air Staff, 14
AIRCOMNET, 22
Aircraft, 15, 33; see also individual aircraft
Aircraft/Missile Maintenance Operational Status Report (AMMOSR), 24-25, 31
Aircraft/Missile Maintenance Production Compression Report, 25; see also Aircraft/Missile Maintenance Operational Status Report
Anniston, Alabama, 12
APEX reports, 19, 22
Army, 2, 23
Ash, Lieutenant Colonel Edward S., 24
Atlantic Command, 2
Augmented Command Post, 26-27
Augmented forces, 29

B-52 AIRCRAFT, 24
Bare base station sets, 10, 34
Bare bases, 9
Base procurement office, 4

Base stocks, 32
Berlin emergency, 4
Bradley, General Mark E. (Jr), 15-20, 28, 37
Brookley Air Force Base, 22

C-119 AIRCRAFT, 3
C-123 aircraft, 3
C-124 aircraft, 4
C-130 aircraft, 27
Caribbean area, 1-2, 36
Carswell Air Force Base, 22
Castro, Premier Fidel, 1-2
CBU munitions, 13
Central Logistics Control Room, 31
Chief of Staff (USAF), 12-14
Chronologies (Cuban Crisis), 14-15, 21, 27, 38
Cold War, 2, 6
Combat operations, 4
Command coordinator, 26
Command historian, 14
Command Operations Control Center; see 473L System
Command Post, 15, 21, 25-26, 38-39
Communications, 16-17, 22
Communications and electronics equipment, 3
Consolidated materiel distribution objective (CMDO), 2-3, 11-12, 16
Contingency operations, preparations for, 2; problems of, 6, 20, 27, 36; support of, 9, 15-16, 24, 28; WRM items for, 17; development of, 19; specialized group for, 26; better control involving, 30-31; improved support of, 34, 37, 39
Conventional warfare, 20, 29

"D TO P" CONCEPT, 29
DefCon 3, 19
Defense Supply Agency (DSA), 23-24
Department of Defense (DOD), 19, 28, 32, 37
Deployment bases, 4, 15-16, 30
Depot stocks, 10
Direct support, 23
Directorate of Maintenance Engineering, 24-25, 33-34
Directorate of Operations, 21
Directorate of Plans and Programs, 23-24

UNCLASSIFIED

Directorate of Procurement and Production, 27
Directorate of Supply, 23-24
DSA centers, 23

EMPLOYMENT BASES, 15-16
European Theater, 34-35
Exercise "High Heels," 26

F-100 AIRCRAFT, 34
F-105 aircraft, 27
400 series requests, 22-23
473L System, 30-31
Field activities, 8, 16, 22, 25; see also Air materiel areas
Field historians, 14
Florida, military buildup in, 1; deployment of armed forces
to, 2; bases in, 3, 15, 27, 36; base procurement in, 4;
withdrawal of items from, 6-7; storage of fuel tanks in,
12; POL in, 13
Flyaway kits, 23, 34
Force planning, 15-16
Forward bases, 6, 10
Fuel tanks, 4, 12, 17-18, 27
Funds, 17-18, 30

GAM-83 MISSILES, 11-12, 23
General purpose forces, 28-29
General war, 3, 26-27, 33-34
Georgia, 12
Gray Eagle packages, 9-10, 32

HEADQUARTERS AFLC, logistics preparations at, 2-3; achievements of, 3-5; logistics support from, 6-13; provides historical record, 14-15; experiences of, 15-16; receives requirements, 16; WRM shortages at, 17-18; seeks target dates, 18; directive to AMA's, 19; problems and solutions, 21-27; outlines problem areas, 28-29; views on transportation, 30; furnishes data for 473L System, 30-31; responsibility of, 32; maintenance production lines of, 33-34; improves support, 34-35; successful support of Cuban buildup, 36-37; other improvements at, 38; evaluation efforts of, 39

Headquarters components, 21, 27

UNCLASSIFIED

Headquarters USAF, inability to furnish WRM requirements, 2; directive from, 3, 7-8; operational summaries, 4; establishes ad hoc committee, 6, 20; authorizes bare base station sets, 9-10; plans concerning WRM, 11-13; approves requirements, 16; authorizes prepositioning of materiel, 18; letter to, 19; coordination with, 23-24; action messages to, 27; functional components at, 28; accepts suggestion, 29; Logistics Planning Directorate at, 31; revises AFR 67-44, 32; responsibilities of, 33-34

Historical account (Cuban Crisis), 14-15, 38

Historical Division; see Historical Research Division

Historical Liaison Office (USAF), 14, 20n

Historical Research Division, 14-15, 27, 38

Homestead Air Force Base, 11-13

Housekeeping items, 9

JET FUEL REQUIREMENTS, 27

Joint Chiefs of Staff, 15

KELLY AIR FORCE BASE, 22

Kennedy Administration, 37

Kennedy, President John F., 1-2

Khrushchev, Premier, 2

Korean War, 37

LEBANON CONTINGENCY, 4, 22

Letterkenny Army Ordnance Depot, 12

Limited war, 17-18, 37

Line items, 3-4, 8, 17

LOGAIR, 4

Logistics, system, 3, 14-20, 36-37, 39; support, 6, 15; planning, 19; requirements, 30-31

Logistics Planning Directorate, 31

MAC DILL AIR FORCE BASE, 11-12

Maintenance acceleration, 19, 24-25

Maintenance compression, 19, 24-25, 33

Maintenance engineering, 24-25, 32-33

Maintenance Engineering Aircraft/Missile Report (MEAMR), 24-25

Maintenance production lines, 33-34

UNCLASSIFIED

Major air commands, 14-17, 20, 32-33
Manpower, 9, 11, 25-26; see also Personnel
Manpower and Organization Division, 25-26
Materiel, requirements, 2; deficiencies, 4, support, 23; shortages, 36
McCoy Air Force Base, 11-13
Message distribution, 26-27
Middletown Air Materiel Area (MAAMA), 12-13
Military Air Transport Service (MATS), 3, 15-17
Military strategy, 17-18, 37
Missile bases, 1, 3
Missiles, 1-2, 33
Mission Support Division, 23
Modification, 4
Munitions, 10-13, 18, 23

19th AIR FORCE, 2
Navy, 2, 23

OGDEN AIR MATERIEL AREA (OOAMA), 17, 19
Oklahoma City Air Materiel Area (OCAMA), 24
Opalocka, 7-10
Operating bases, 3, 13, 16
Operating stocks, 17
Operational plans, 2-4, 7-16, 19, 23-25, 37; see also War plans
Operational Report System; see APEX reports
Operational requirements, 19
Oversea bases, 30

PACIFIC AIR FORCES (PACAF), 10
Payant, Lieutenant Colonel Peter, 24
Personnel, 16-17, 20-21, 24, 30; see also Manpower
POL, 10n, 12-13
Possessed Aircraft/Missile Report (AMREP), 24-25
Prepositioning, 7-8, 10, 18, 32-33
Procurement, 10, 18
Production items, 18
Programming, 29
Project codes, 23
Provisional commanders, 7
Pylons, 4, 17-18, 27

UNCLASSIFIED

"QUARANTINE," 1

REQUIREMENTS LIST, 10

Research and development items, 16-17, 29

Robins Air Force Base, 12, 22

Rome Air Materiel Area (ROAMA), 22-23

SACRAMENTO AIR MATERIEL AREA (SMAMA), 34

San Antonio Air Materiel Area (SAAMA), 10, 19

Secretary of Defense, 28-29

South America, 9

Soviet Union, 1-4, 37

Spare parts requisitions, 23

Special handling equipment, 30

Stockage objectives, 11, 28-29

Storage, sites, 3, 9, 12; requirements, 11, 32, 35; central, 18, 37; theater, 37

Strategic Air Command (SAC), 3, 12-13, 15-16

Sturgis, Lieutenant Colonel James E., 21

Supply discipline, 22-23

Supply pipelines, 4, 36

Support, planning, 2-3, 6-7; requirements, 3-4, 6, 13; problems, 4, 21-27; worldwide, 16; mission, 38

Survey team, 11

Swift Strike III, 34

2709th AIR FORCE VEHICLE CONTROL GROUP, 8

TAC bases, 19, 23

Tactical Air Command (TAC), 2-4, 6-9, 11-13, 20, 28, 34

Taiwan contingency, 4, 22

Target dates, 18

Technical order compliance, 32, 35

Teletype traffic, 22

Thant, Secretary U, 2

Tinker Air Force Base, 22

Transportation, 3, 7-8, 13n, 18, 30

Troop carrier squadrons, 3

UNITED NATIONS, 1-2

United States, 1-2, 36-37

United States Air Forces in Europe (USAFE), 10, 34-35

USAF Short-range Wartime Requirements Plan, 10, 13, 29

UNCLASSIFIED

VEHICLES, 4, 6-10

Vice Chief of Staff (USAF), 4, 14-15

WAR AND EMERGENCY PLANS BRANCH, 6

War consumables, 3-4, 10-13, 29-30

War Consumables Distribution Objective (WCDO), 13

War mission aircraft, 4, 24

War plans, 18, 29; see also Operational plans

War readiness materiel (WRM), 2, 6-7, 11-12, 28-29, 32-33

Warner Robins Air Materiel Area (WRAMA), 9-10, 12

Weapon systems, 37; see also individual systems

World War II, 36

WPS; see USAF Short-range Wartime Requirements Plan

WRM assets, 31, 33

WRM consumables, 3, 18

WRM monitor, 32-33

WRM requirements, 16-18, 29